Assessing Reportable Medical Events (RME) in the Central Command Area of Operations (CENTCOM-AOR), CY2003-CY2006

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Abstract

Inpatient and medical evacuation records from the Central Command area of operations (CENTCOM-AOR) were evaluated for diagnoses indicative of Reportable Medical Events (RME) from Jan 2003 - Dec 2006. These records were compared to inpatient records and RME reports submitted to the Defense Medical Surveillance System (DMSS) used in-garrison during this same timeframe for CENTCOM-deployed service members. The objectives were to determine the potential magnitude of RME in-theater and to identify gaps between in-theater and in-garrison reporting systems. The analysis revealed that RME reports among service members receiving medical care within the CENTCOM-AOR (i.e. echelons I-III) were not adequately nor consistently reported, validated or effectively captured to allow robust epidemiologic analysis. In addition, approximately 21% of RME identified during deployment were captured exclusively from the in-theater systems evaluated, further highlighting the reporting gap. Contributing factors include the lack of an RME system in theater tied to the official RME repository in the DMSS; inconsistent enforcement and use of deployed medical surveillance systems, limited medical personnel staffing, and Operational Tempo.

Background

- There are roughly 70 Department of Defense (DoD) identified reportable medical events (RME) that are required to be reported to military public health assets using reporting procedures similar to those established in the civilian public health community.
- RME for service members receiving medical care in-garrison (i.e. echelon IV and V) are documented, monitored, and validated by the Army Medical Surveillance Activity (AMSA) for entry into the Defense Medical Surveillance System (DMSS). Reports are submitted by medical providers following lab confirmation or a clinical assessment that meets AMSA designated clinical case definitions.
- RME among service members engaged in combat operations such as those occurring in the CENTCOM-AOR within echelons I-III medical facilities are not adequately nor consistently reported, validated or effectively captured to allow robust epidemiologic analysis.
- Currently there is no RME system in theater tied to the official RME repository in the DMSS. Reports are primarily transmitted via email as MS Word attachments, functioning as an archival rather than a relational database or surveillance system that can be effectively monitored.
- RME associated with deployment are only systematically captured in the DMSS if:
  - Diagnosed after medical evacuation out of theater to a higher echelon of care (levels IV & V)
  - Diagnosed in-garrison, post deployment
  - Diagnosed in-garrison, during rest and relaxation (R&R) breaks
  - Reported to the Landstuhl Regional Medical Center (LRMC) for submission into the DMSS.
- The lack of an RME reporting system in-theater that links to the DMSS represents a reporting gap that needs to be addressed.

Methods

- Electronic hospitalization and medical evacuation records originating from the CENTCOM-AOR were used as a proxy for RME report submissions within theater. Records were evaluated for primary diagnoses indicative of RME during calendar years (CY) 2003-2006 and compared to in-garrison RME among service members deployed to the CENTCOM-AOR during the same timeframe.
- In-garrison records were obtained from the DMSS maintained inpatient and RME system (RMES) records, and limited to recorded primary diagnosis codes indicative of an RME, documented during deployment or within 30 days post-deployment.
- In-theater records were obtained from 2 sources:
  - Patient Administration Systems and Biostatistical Activity (PASBA) Standard Inpatient Data Records (SIDR)
  - TRANSCOM Regulating AND Command and Control Evacuation System (TRAC^{2}ES)
- Analyses were restricted to incident occurrences for a given primary diagnosis code.
- Diagnoses were categorized into 6 groups. **Table 1**
- Additional in-theater medical data sources such as the outpatient data submitted through the Joint Medical Workstations (JMEWS), and tracking application data for both inpatient and outpatient facility transfers (e.g. Joint Patient Tracking Application (JPTA) and Patient Accounting & Reporting Real-time Tracking System (PARRTS)) were not available for inclusion in the analysis.

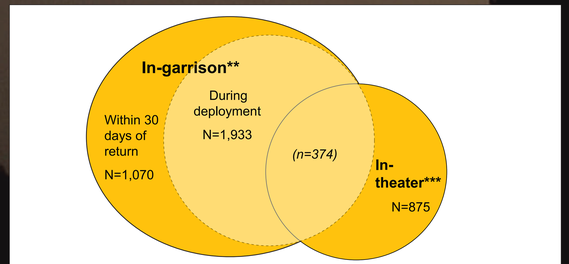
Table 1. RME Diagnostic Categories

Food/Water-borne	Cholera, Typhoid Fever, Salmonella, Shigellosis, Botulism, Amebiasis, Giardiasis, Cryptosporidiosis, Cyclospora, E coli, Campylobacter, Brucellosis, Listeriosis
Vaccine-Preventable	Anthrax, Pertussis, Tetanus, Poliomyelitis, Smallpox, Varicella, Measles, Mumps, Rubella, Influenza, Hepatitis A, Hepatitis B
Arthropod-borne	Yellow Fever, Dengue, Encephalitis, Rift Valley Fever, Ehrlichiosis, Rocky Mountain Spotted Fever (RMSF), Malaria, Leishmaniasis, Lyme Disease, Filariasis
Sexually Transmitted Infections (STI)	Syphilis, Gonorrhea, Non-gonococcal Urethritis, Chlamydia
Environmental	Heat Injury, Cold Weather Injury
Other	Tuberculosis, Hepatitis C, Q fever, Invasive Streptococcus Group A, Meningococcal disease, vaccine adverse events, chem./bio exposures, etc.

Results

- A total of 3,504 incident RME were documented among CENTCOM deployed personnel during deployment or within 30 days of return during CY2003-2006; 2,629 (75%) were exclusively reported in-garrison, 501 (14%) exclusively in-theater, and the remaining 11% were captured in both garrison and theater systems. **Figure 1**
  - Excluding cases captured post-deployment, approximately 21% of RME reports during deployment were captured exclusively through in-theater data sources.
  - 97% of in-garrison RMEs were documented through the RMES rather than through inpatient records.
  - 68% of in-theater RME required medical evacuation from CENTCOM to a higher echelon of care.
- 1070 (40.8%) of in-garrison RME had an estimated date of onset within 30 days of redeployment; these were primarily for sexually transmitted infections (STI). STIs were also the predominately reported RME captured in-garrison during deployment, yet relatively few were reported through in-theater systems. **Table 2**
- RME peaked in September 2003, primarily due to increases in arthropod-borne diseases such as malaria and leishmaniasis. **Figure 2**

Figure 1. Incident Reportable Medical Events, CY2003-CY2006 (N=3,504)*



*A total of 3,991 RME reports were received from multiple in-garrison or in-theater sources (DMSS, TRAC^{2}ES, PASBA)

**2899 (97%) of DMSS in-garrison RME incidents were retrieved through the RMES

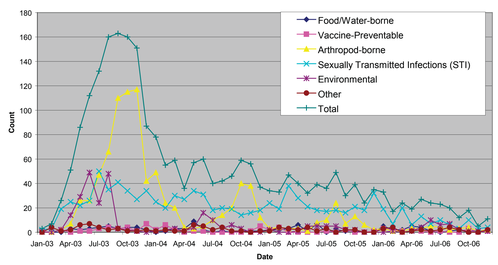
***594 (68%) of in-theater RME incidents were retrieved through the TRAC^{2}ES medevac data

Table 2. RME Categories by Data Source and Onset *

During Deployment	Garrison only	Theater only	Garrison and theater	Total
Food/Water-borne	73	26	1	100
Vaccine-Preventable	43	26	1	70
Arthropod-borne	395	178	347	920
Sexually Transmitted Infections (STI)	939	27	2	968
Environmental	75	187	20	282
Other	41	57	3	101
Total	1566	501	374	2441
Within 30 days of Redeployment	**Garrison only**	**Theater only**	**Garrison and theater**	**Total**
Food/Water-borne	42			42
Vaccine-Preventable	24			24
Arthropod-borne	63			63
Sexually Transmitted Infections (STI)	907			907
Environmental	13			13
Other	14			14
Total	1063			1063
Grand Total	**2629**	**501**	**374**	**3504**

*Garrison data source = DMSS; Theater data sources – TRAC^{2}ES & PASBA

Figure 2. RME Category Trends, CY2003-2006



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Discussion

- RMEs have sharply declined as more and more cases are now treated in theater outpatient settings. Leishmaniasis, in particular has declined due to policy changes to limit medical evacuation for treatment when in-theater care is available.
- The large number of STI diagnosed in-garrison both during deployment and within 30 days of return contrast greatly to the small amount diagnosed in-theater. This may be due to service members contracting an STI during R&R breaks and upon return from combat zones or simply due to a delay in seeking diagnosis/treatment for in-theater acquired STIs.
- Women are also more likely to be diagnosed with an STI during R&R and immediately post deployment during a routine exam since pap tests are not available in-theater .
- Although diagnosis codes entered during outpatient care are believed to be less reliable because they generally lack lab confirmation, they are worthy of further exploration when assessing in-theater RME since inpatient data and RME reports are sparse. This is particularly true for STIs which are typically diagnosed in the outpatient setting.
- The Theater Medical Information Program (TMIP) currently maps RME related outpatient codes to produce weekly alerts within JMEWS; however, these are not currently validated and reporting is sparse.
- Tracking application data such as PARRTS and JPTA should also be considered for future analyses.
- Consolidation of multiple sources such as these (inpatient, outpatient, and tracking application data) would allow a better retrospective assessment of RME in-theater.
- As recently as July 2007, deployment of improved inpatient data systems throughout CENTCOM were completed which will enable direct transfer of electronic inpatient data. This should streamline the process of assessing prospective health outcomes such as RME in the future.

Limitations

- RME reported from the in-theater data sources used in this analysis underestimate the true incidence.
- The in-theater inpatient data used in the analysis are based on manual entry of hard copy medical records shipped from Army Combat Support Hospitals (CSH) in theater, resulting in incomplete and delayed data capture.
- Inpatient records from Air Force and Navy medical facilities were not available.
- Lab confirmation of theater data is not available.
- Direct electronic inpatient data from facilities in-theater were not available due to limitations with the applications used. New inpatient applications to correct these problems were not deployed theater-wide until July 2007.
- Outpatient data and patient tracking application data (e.g. JPTA and PARRTS) which may have yielded additional probable RME were excluded from the analysis.
- The possible association between RME such as STI and R&R breaks could not be assessed because these dates were not available. However, even with this data it would be difficult to ascertain whether the infection was newly acquired, acquired in-theater, or acquired before deployment.

Conclusion/Recommendations

- The overwhelming majority of in-garrison documented RME among CENTCOM deployed personnel are not captured in inpatient records, suggesting that most are diagnosed in the outpatient setting. Because most RME reports are submitted following lab confirmation, typically not available until after outpatient disposition, the RMES likely remains the primary source for RME documentation, highlighting the importance of such systems.
- Currently there is no RME system in theater tied to the official RME repository in the DMSS, representing a significant reporting gap. This analysis revealed that 21% of RME with onset during deployment were missed due to this gap. However, given the lack of inpatient and lab data in-theater, this is an underestimate of the true reporting gap.
- As a temporary fix theater preventive medicine assets have begun forwarding RME cases to LRMC for submission into the DMSS. A permanent solution, a “web based” upgrade to the DMSS RMES, is in development.
- Additional contributing factors to the reporting gap include inconsistent enforcement and use of deployed medical surveillance systems, limited medical personnel staffing, and Operational Tempo.
- Understanding the full magnitude of RME in theater will require a consolidation of multiple data sources. Additional inpatient, outpatient, and tracking application data should be examined.
- Providers in theater should implement reporting procedures followed in-garrison to include reporting RME through AMSA for validation and entry into DMSS. Guidelines to establish clinical case definitions and surveillance of non-lab confirmed cases should also be established given that lab confirmation is often not attainable in-theater.